

## **2007 Ozone Impacts to the Antelope Valley and Mojave Desert Air Basin**

The SCAQMD 2003 Air Quality Management Plan provides future-year controlled emissions projections of ozone for the South Coast Air Basin and three adjacent downwind air basins: South Central Coast (Ventura County), Mojave Desert (Antelope Valley and Mojave Desert) and the Salton Sea (Coachella Valley). The 2007 ozone projections were simulated using the Urban Airshed Model (UAM). UAM was selected as the primary modeling tool for the 2003 ozone plan. Additional simulations presented in the 2003 AQMP used the California Photochemical Grid Model (CALGRID). The CALGRID simulations were conducted to support the primary UAM simulations. Detailed discussion of the UAM and CALGRID ozone modeling and attainment plans are provided in Appendix V of the 2003 AQMP.

The UAM simulations were conducted for two historical episodes: the August 4-7, 1997 meteorological episode that occurred during the Southern California Ozone Study (SCOS97) and for the August 27-29, 1987 meteorological episode that occurred during the Southern California Air Quality Study (SCAQ87). The 1987 meteorological episode was previously simulated for the 1991, 1994 and 1997 AQMPs. CALGRID was only simulated for the August 4-7, 1997 meteorological episode. The primary days for the two meteorological episodes included August 5<sup>th</sup> and 6<sup>th</sup> for the 1997 episodes and August 27<sup>th</sup> and 28<sup>th</sup> for the 1987 episode. Of the two meteorological episodes simulated, the August 4-7, 1997 episode was ranked to be more severe than the 1987 episode and is considered to be near the upper limit of expected ozone impacts.

Table 1, taken from the 2003 AQMP, Appendix V, (Table 3-14), summarizes the UAM simulated 2007 ozone concentrations for the Basin and its neighbors for the 1997 and 1987 meteorological episodes assuming that all identified projected emissions controls are in place. Table 2, taken from the 2003 AQMP, Appendix V, Attachment-7, provides the CALGRID simulated 2007 ozone concentrations for the Basin and its neighbors for the 1997 meteorological episode using the same emissions. As presented in the 2003 AQMP, the UAM simulations for the Basin fail to reach the federal 1-hour ozone standard in 2007. The projected ozone concentrations for Ventura County and Coachella Valley meet the federal standard on all days simulated. The UAM projections for the Antelope Valley and Mojave Desert meet the federal standard on three of the four days with the sole exception of August 6<sup>th</sup>. The 2007 CALGRID simulations for the August 1997 meteorological episode indicate that all areas with the exception of the Basin will meet the federal standard.

In both tables, a scaled projection of the predicted ozone is presented in brackets for the August 6<sup>th</sup> simulation. The use of a relative reduction ratio (RRR) is designed to calibrate the prediction based upon the model's ability to recreate ozone concentrations in the Antelope Valley and Mojave Desert in the base-year simulation. As depicted, both the UAM and CALGRID simulations are scaled downwards in concentrations using the RRR methodology.

For the UAM simulation, ozone concentrations in the Antelope Valley were scaled downward (by a 0.70 RRR multiplier) to reflect the 42 percent over prediction that occurred at the Lancaster air monitoring station. Similarly, ozone concentrations in the Mojave Desert portion of San Bernardino County were scaled downward (by a 0.75 RRR multiplier) to reflect the 33 percent average over prediction that occurred at the Hesperia and Victorville air monitoring stations.

For the CALGRID simulation, ozone concentrations in the Antelope Valley were scaled downward (by a 0.59 RRR multiplier) to reflect the 70 percent over prediction that occurred at the Lancaster air monitoring station. Similarly, ozone concentrations in the Mojave Desert portion of San Bernardino County were scaled downward (by a 0.91 RRR multiplier) to reflect the 9 percent average over prediction that occurred at the Hesperia and Victorville air monitoring stations.

**TABLE 1**

**UAM Simulated 2007 Maximum Ozone: Controlled Emissions**

Episode Day	Basin	Coachella Valley	Antelope Valley	Mojave Desert	Ventura County
August 5, 1997	145	122	92	118	89
August 6, 1997	151	83	141 (99)*	148 (111)*	106
August 27, 1987	115	94	99	115	101
August 28, 1987	138	83	105	119	103

\* Concentrations for the high desert inside the brackets is the scaled value to adjust for systematic over prediction in the base year

**TABLE 2**

**CALGRID 2007 Projected Maximum 1-Hour Ozone Concentrations (ppb)**

Episode Day	Basin	Coachella Valley	Antelope Valley	Mojave Desert	Ventura County
August 5, 1997	135	121	107	105	95
August 6, 1997	123	117	123 (72)*	122(112)*	112

\* Concentrations for the high desert inside the brackets is the scaled value to adjust for systematic over prediction in the base year

Table 3 summarizes the base year (1997) UAM and CALGRID model performance ratios (MPR) for the August 5<sup>th</sup> and 6<sup>th</sup> meteorological episodes in the Antelope Valley and at an expanded number of monitoring sites in the Mojave Desert. In general, the base-year UAM MPRs for the August 5<sup>th</sup> episode are within 20 percent of unity and meet EPA's recommended model performance criteria. The UAM MPRs for August 6<sup>th</sup> demonstrate

a consistent pattern of over prediction in the high desert areas. The CALGRID MPRs indicate over prediction at all sites for both episode days. Table 4 provides the corresponding RRRs for each model and meteorological episode at the selected sites. The RRR is calculated as the inverse of the MPR at each site (1/MPR).

Figure 1 depicts the 2007 grid level UAM predicted maximum concentration map for the August 6<sup>th</sup> meteorological episode. Figure 2 focuses on the UAM peak predicted 1-hour maximum ozone concentrations for each jurisdictional area.

As depicted in Figure 1, a limited ozone impact is predicted near Lancaster, with a local peak concentration of less than 130 ppb. The primary impact to the Antelope Valley (141 ppb) occurs in the southeast most grid of the region, at the county line, in an area adjacent to the bulk of transported smog plume impacting the Mojave Desert. The closest monitoring station to the grid having the predicted peak concentration in the Antelope Valley is Phelan, in the Mojave Desert jurisdiction (see Figure 2). The UAM MPR used to calculate the RRR for the Antelope Valley in the 2003 AQMP was 1.43 based on the Lancaster site. Note that the ratios for Phelan and the multi-site Mojave Desert station average are 1.48 and 1.44, respectively. The consistency between the ratios for Lancaster, Phelan and the multi-site average lends confidence that the RRR for the Antelope Valley is not being dominated by a single "outlier" MPR but is reflecting an overall impact to the high desert.

The Phelan and multi-site MPRs for the Mojave Desert jurisdiction are marginally higher than the Hesperia and Victorville average used to generate the RRR for the 2007 UAM predictions presented in the 2003 AQMP. (The Phelan air monitoring site was located in the grid adjacent to the grid with the maximum predicted Mojave Desert ozone concentration). The two-site average provides a more conservative adjustment for the base-year model over prediction with higher predicted ozone concentrations.

Table 5 summarizes the range of adjustments made to the 2007 UAM ozone model simulations. When adjusted using the RRR methodology, the predicted ozone impacts to both jurisdictions in the high desert are below the federal 1-hour standard (125 ppb).

The CALGRID simulations over predict ozone concentrations in the high desert on both days in the Antelope Valley and to a lesser extent in the Mojave Desert. Despite the base year over prediction, the 2007 CALGRID simulations for the August 5<sup>th</sup> and 6<sup>th</sup> meteorological episodes are less than the federal 1-hour ozone standard. The MPRs and corresponding RRRs for the high desert jurisdictions effectively lower the predicted impacts further as shown in Table 5. Regardless, the adjusted and unadjusted CALGRID simulations support the use of the RRR for the UAM simulation and concur with the conclusion that the Antelope Valley and Mojave Desert will be in attainment with the federal 1-hour ozone standard in 2007.

**TABLE 3**

Base Year Model Performance Ratio (MPR):  
Predicted/Observed 1-Hour Maximum Concentration

Location	UAM		CALGRID	
	August 5, 1997	August 6, 1997	August 5, 1997	August 6, 1997
Antelope Valley				
Lancaster	1.03	1.43	1.50	1.70
Mojave Desert				
Phelan	1.13	1.48	1.44	1.24
Cajon (MDAQMD)	0.96	1.60	1.55	1.24
Cajon (AV)	N/A	1.48	N/A	1.15
Hesperia	1.14	1.36	1.51	1.09
Victorville	0.83	1.29	1.31	1.09
Average of Hesperia and Victorville	0.99	1.33	1.41	1.09
Multi-Site Average (excluding Lancaster)	1.02	1.44	1.45	1.16

**TABLE 4**

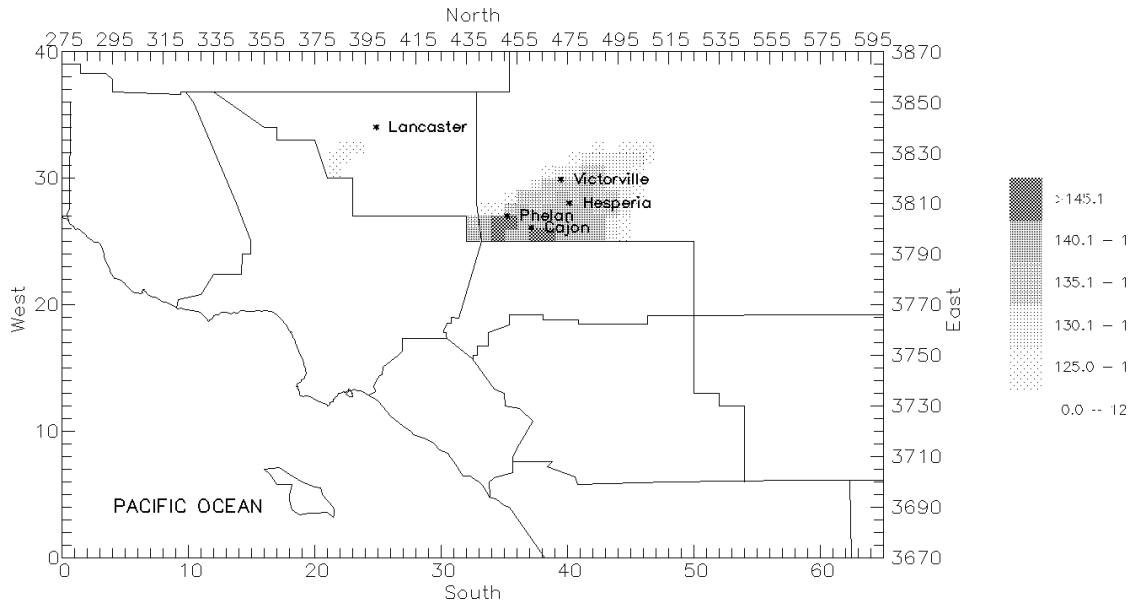
Model Stimulation Relative Reduction Ratios (RRR):  
[1/MPR]

Location	UAM		CALGRID	
	August 5, 1997	August 6, 1997	August 5, 1997	August 6, 1997
Antelope Valley				
Lancaster	0.97	0.70	0.67	0.59
Mojave Desert				
Phelan	0.88	0.68	0.69	0.81
Cajon (MDAQMD)	1.04	0.63	0.65	0.81
Cajon (AV)	N/A	0.68	N/A	0.87
Hesperia	0.88	0.74	0.66	0.92
Victorville	1.20	0.78	0.76	0.92
Average of Hesperia and Victorville	1.01	0.75	0.71	0.92
Multi-Site Average (excluding Lancaster)	0.98	0.69	0.69	0.86

**TABLE 5**

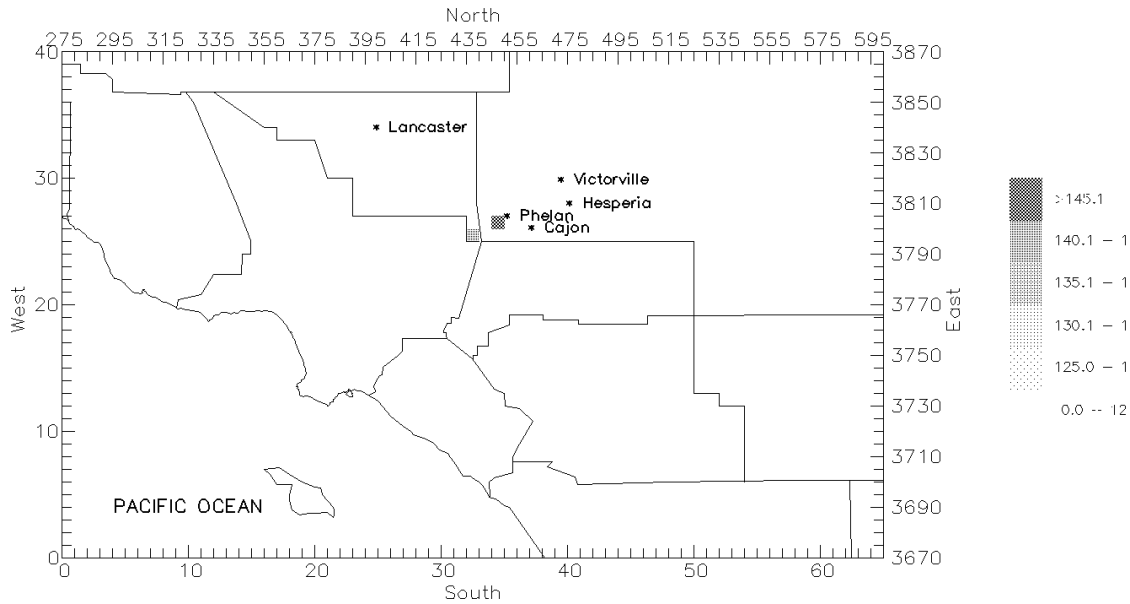
Relative Reduction Ratio (RRR) Adjusted 2007 Projected Maximum 1-Hour  
Ozone Concentrations (ppb)

Scenario	RRR	Antelope Valley	Mojave Desert
UAM Simulation			
August 5, 1997	Lancaster	89	---
	Phelan	81	104
	Hesperia-Victorville	93	119
	5-Site Average	90	116
August 6, 1997	Lancaster	99	---
	Phelan	96	101
	Hesperia-Victorville	106	111
	5-Site Average	97	102
CALGRID Simulation			
August 5, 1997	Lancaster	72	---
	Phelan	74	72
	Hesperia-Victorville	76	75
	5-Site Average	74	72
August 6, 1997	Lancaster	73	---
	Phelan	100	99
	Hesperia-Victorville	113	112
	5-Site Average	106	105



**FIGURE 1**

UAM 2007 simulated ozone concentrations (ppb) for the Antelope Valley and Mojave Desert portion San Bernardino County for the August 6, 1997 meteorological episode.



**FIGURE 2**

Grid locations of the UAM 2007 simulated peak ozone concentrations (ppb) for the Antelope Valley and Mojave Desert portion San Bernardino County for the August 6, 1997 meteorological episode.